ORIGINAL

AMERICAN TRUCKING ASSOCIATIONS

2200 Mill Road • Alexandria, VA 22314-4677

Engineering Department
(703) 838-1842
Fax (703) 683-1934

July 23, 1992

Ms. Donna Searcy
Secretary
Federal Communications Commission
1919 "M" Street NW
Washington, D.C. 20554

Re: RM No. 8013

Dear Ms. Searcy:

On behalf of the American Trucking Associations ("ATA") this is to express our opposition to the petition for rulemaking noted above recently filed by PacTel Teletrac proposing changes to the rules pertaining to automatic vehicle monitoring (AVM) systems.

American Trucking Associations is the national trade association of the trucking industry. Through its 51 affiliated state trucking associations, located in every state and the District of Columbia, 9 affiliated conferences, 7 Councils, and four thousand individual motor carrier members, ATA represents over 30,000 motor carriers of every type and class in the country. Many of ATA's members operate extensive radio systems, licensed by the Federal Communications Commission in the Motor Carrier Radio Service. ATA has continually represented the Motor Carrier Radio Service licensees' collective interests before the FCC.

The trucking industry is vital to commerce in the United States. In 1989, the trucking industry, as a whole, earned $257 billion in gross freight revenues, representing 78% of our nation's freight bill and 5% of the Gross National Product. Trucks haul 2.5 billion tons of freight, representing 40.5% of the total intercity tonnage carried by all modes of transportation. There are approximately 90,000 for-hire trucking firms in the United States, over 40,000 of which are interstate carriers. These firms operate approximately one million vehicles. The nervous system that coordinates and controls this distribution system is currently radio.

One of the ATA Councils is the Management Systems Council (MSC). The MSC is the national association composed of executives responsible for motor carrier management information systems (MIS), telecommunications, and electronic data processing. Formed in 1965, the Council is responsible for standards development and coordination in the areas of radio frequency identification (RFID), bar codes, electronic data interchange (EDI), Vehicle Maintenance Reporting Standards (VMRS), as well as other MIS related areas.

The MSC is very active in inter-industry coordination of standards. It is a member of the steering committee for the Standards and Protocols Committee of Intelligent Vehicle Highway Systems (IVHS) America, which is responsible for the coordination of standards as they relate to vehicle to infrastructure communications; a member of the American National Standards Institute (ANSI); a member of Accredited Standards Committee X12 (ASC X12), which is responsible for U.S. and international EDI standards; a member of X12's Steering Committee; chairman of one of X12's 12 Subcommittees; a member of International Standards Organization (ISO) Technical Committee 104 (TC104) and ISO TC154; a member of the Board of Directors of the Federation of Automated Coding Technologies (FACT), which is responsible for bar code standards; as well as an active participant in standards development for other industries.

We understand that grant of the PacTel petition would have the effect of according exclusive future use of the 904-912 MHz and 918-926 MHz portion of the radio frequency spectrum to PacTel and similar users. This exclusive authority would significantly interfere with implementation of Automatic Vehicle Monitoring (AVM) technology by the members of our associations.

The ATA adopted an industry standard relating to AVM technology in 1990. This standard specifies requirements for the automatic identification of equipment ("AEI") used in road transportation by tractors, trailers, dollies, intermodal containers and intermodal chassis. These standards are compatible with the standards adopted by the International Standards Organization ("ISO"), American National Standards Institute ("ANSI"), and the Association of American Railroads ("AAR"). These compatible standards have resulted in a "seamless" system for tracking the movement of equipment both internationally and nationally, regardless of whether such equipment moves by ship, rail, or highway.

Under the ATA standard, the previously listed items of equipment are outfitted with tags (transponders). Readers are placed at various locations to record the movements of the equipment. While some applications may require only one or two such readers, others need many readers in the same general location. The ATA standards require operation in the 902-928 MHz portion of the spectrum; 912 MHz is designed as the primary frequency. (A copy of the ATA standard is enclosed.)

Our members view this form of AVM as a major productivity multiplier that will aid the industry in maintaining the safe and efficient operation of fleets. For example, the trucking industry uses AVM tags to communicate when vehicles pass through ports of entry from one state to another with little or no downtime from stopping. In response to the standards, trucking companies, railroads, ocean carriers, airports, and sea ports have all begun a program of tagging equipment and installing readers. For example, J.B. Hunt, the nations second largest truckload carrier, is in the process of installing an ATA standard tag on its entire fleet. In excess of 30,000 transponders are in active use today on commercial vehicles.

The same technology is being used to expedite the payment of highway tolls. Through a coordinated effort, a compatible AVM system has been adopted by toll roads in Oklahoma and Kansas. Many of these transponders, used for electronic toll collection and traffic monitoring (ETTM) purposes, are on commercial vehicles which travel throughout the United States. In excess of 120,000 transponders are in use today in Oklahoma.

These are but a few of the beneficial uses of this technology. The benefits flowing from this technology save time and lower operating costs to shippers and public agencies.

The grant of exclusive use of a broad portion of the 902-928 spectrum to PacTel would clearly interfere with the ability of our members to comply with the ATA standards. Moreover, such a grant to PacTel would frustrate the purpose of the ISO, ANSI, AAR standards, as well as numerous implemented systems.

In summary, the 902-928 MHz spectrum is required under the ATA standards and other standards applicable to the transportation industry in general. A grant to PacTel of the exclusive use of a broad portion of this spectrum would potentially nullify these standards. We do not want to see this happen because of the years of effort and expense that went into developing the standards and the money that has been spent to-date on AEI equipment by members of our association.

We urge the Commission to preserve for use by our members the amount of the 902-928 MHz spectrum that is currently available for AEI applications including spectrum at 904 - 912 and 918 - 926 MHz. Accordingly, we request that the Commission deny PacTel's request.

Sincerely,

Ken Siegel
Associate General Counsel

cc: Mr. Stanley M. Gorinson
Winthrop, Stimson, Putnam & Roberts
1133 Connecticut Avenue
Washington, D.C. 20036
Counsel for PacTel

AMERICAN TRUCKING ASSOCIATIONS STANDARD FOR AUTOMATIC EQUIPMENT IDENTIFICATION

May 10, 1990

0. Introduction and System Requirements

0.1 Scope

This American Trucking Associations (ATA) Standard specifies requirements for the automatic electronic identification of equipment used in road transportation, such as tractors, trailers, dollies, intermodal containers, and intermodal chassis (subsequently referred to as "equipment" in this document). The installation of this identification system on freight equipment is not a requirement for acceptance in road interchange service.

This document describes a reflected energy system in which sensing equipment shall decode radio waves reflected by an "Identification Tag" or "Transponder" mounted on equipment used in the transportation industry. The reflected radio waves shall indicate the identification code of the equipment as well as its related permanent information.

0.2 Field of Application

The identification system and data outputs described in this Standard shall be used to identify equipment by its individual alpha-numeric marking and other predefined information. The system and data outputs may be used, as appropriate, for the identification of other equipment whether or not used in road service.

0.3 References

- International Standards Organization, International Standards Organization (ISO) 6346 - Freight Containers - Coding, Identification and Marking
- International Standards Organization, ISO DIS 10374 - Draft International Standard for Automatic Identification of Containers
- Association of American Railroads (AAR) Automatic Equipment Identification Interim Standard, (Current Version)
- AAR Trailer and Container Service Rules 3, Reporting Marks and Numbering System
- Military Standard 810D, Environmental Test Methods and Engineering Guidelines

0.4 Identification System Requirements

0.4.1 General Requirements

For automatic identification purposes, each unit of equipment shall be fitted with a small electronic device (Tag) containing the alpha-numeric marking or identification code of the equipment and related information. When the equipment Tag is in the presence of sensing equipment (Reader) operating on ultra high frequency radio waves, the Tag shall reflect altered radio waves. The Reader shall decode the altered radio waves (modulation) to determine the alpha-numeric identification of the equipment as well as other predefined information which is permanently encoded and resident in the Tag.

The Reader shall optionally add its own identification number, the date and time, and shall transmit this data along with Tag information to the user's computer system. The computer interface shall be specified by the user.

The System shall be expected to accurately read tagged tractors moving at up to 65 mph. The System shall require only one Tag per equipment unit.

0.4.2 Tag Requirements

The Tag shall be tamper-proof and sealed such that it will survive and operate properly under the conditions of its expected operating environment. Tag life shall not be less than 5 years and no maintenance shall be required. The Tag must meet appropriate test standards for long-term physical, radio frequency, thermal, and ultra-violet exposure.

The Tag shall be designed to operate properly within the temperature range of -45 degrees C to +85 degrees C. The Tag must maintain the integrity of stored data at temperatures of -60 degrees C to +85 degrees C.

The Tag shall not be damaged by the normal operation of such devices as electromagnetic sources normally found in or near roadway, railroad, marine or other distribution facilities.

The Tag shall survive and operate through the shock, vibration, and chemical contaminants experienced in road service (and rail and maritime service for intermodal transponders). (Per Military Standard 810D, Acceleration, Vibration, and Shock: 3 g vibration, 20 g for 11 milliseconds shock.)

The Tag shall be capable of being programmed at truck facilities by user personnel.

The Tag attachment method shall be the choice of the user, bearing in mind the roadway environment and life expectancy of the Tag.

The Tag shall be sealed and meet or exceed at least the current version of the following environmental standards or their IEC equivalent:

a)	Low Temperature	Mil. Std. 810D Method 502.2; minimum temperature of -50 degrees C
b)	High Temperature	Mil. Std. 810D Method 501.2 Procedure II; cycled between +70 and +38 degrees C
c)	Mechanical Shock	Mil. Std. 810D Method 516.3 Procedure I; 30 g for 11 milliseconds, half sine pulse
d)	Random Vibration With Temperature	Mil. Std. 810D; Two hour duration/axis up to 3 g -50 degrees C, ambient, and +70 degrees C ambient
e)	Humidity	Mil. Std. 810D, Method 507.2; 95% non-condensing
f)	Rain	Mil. Std. 810D, Method 506.2, Procedure II
g)	Salt Fog	Mil. Std. 810D Method 509.2, Procedure I
h)	Drop Shock	Mil. Std. 810D Method 516.3, Procedure II; height 3.3 meters, impact surface 5 cm plywood backed by concrete

Additionally, the Tag shall meet the requirements of Mil. Std. 810D for Leakage (Immersion), Icing/Freezing Rain, Sand and Dust.

0.4.3 Reader Requirements

No minimum or maximum Reader power shall herein be specified. However, the minimum antenna ERP (effective radiated power) and Reader receiver sensitivity shall be adequate to reliably record the passage of properly presented Tags at distances compatible with typical recording locations such as: entry/exit gates, multi-lane highway checkpoints, weigh stations, terminals and yards, fuel islands, and maintenance facilities. To accommodate these recording locations, the Reader System shall be able to reliably record the passage of a properly presented Tag at distances of at least 42' (13 meters) from the Reader, at passage speeds up to 65 mph. In addition, the Reader System shall be able to discriminate individual tags and record the passage of properly presented Tags separated a distance of 5' (1.5m) or more and passing up to 16' (5m) from the Reader System. The maximum ERP and transmitter power output of the Reader shall be within the limits prescribed by the telecommunications authority of the country in which the Reader shall be operated.

The Reader System must accommodate both fixed and mobile vehicle application.

0.4.4 System Reliability and Accuracy

0.4.4.1 Definition

Reliability and accuracy are defined as follows:

a) System Reliability:

The ability of a system to capture information from every Tag, properly mounted, programmed and presented, which enters its coverage area.

b) System Accuracy:

Assuming the defined conditions for system reliability are met, the system accuracy is the capability of the system to detect incorrect information including bit errors.

0.4.4.2 Requirement

Tags which are properly mounted, programmed and presented to the sensing equipment shall have a minimum system reliability of 99.99% or no more than one no-read in 10,000 readings and a system accuracy of 99.9999% or no more than one undetected incorrect reading in 1,000,000 readings.

1. System Operation

1.1 Components

The radio communication system described herein consists of a Reader System (i.e., Reader, RF Module, and Antenna) and Tags. Tags are placed on objects to be identified, and Readers, Antennas, and RF Modules are installed at points to record the passing of tagged objects. The system is designed for localized application where the Tag passes by the Reader System (either the Tag or Reader may be moving).

1.2 Interconnection

The block diagram of Figure 1 indicates the function of each component. The RF Module transmits an unmodulated signal in the direction of a Tag (f_o). The Tag reflects a modulated signal back to the RF Module (f_{om}). The RF Module receives the reflected signal from the Tag and relays this information to the Reader. The Reader decodes the information transmitted in the reflected signal from the Tag and relays the information to a host computer for subsequent use to identify, track and schedule the tagged objects.

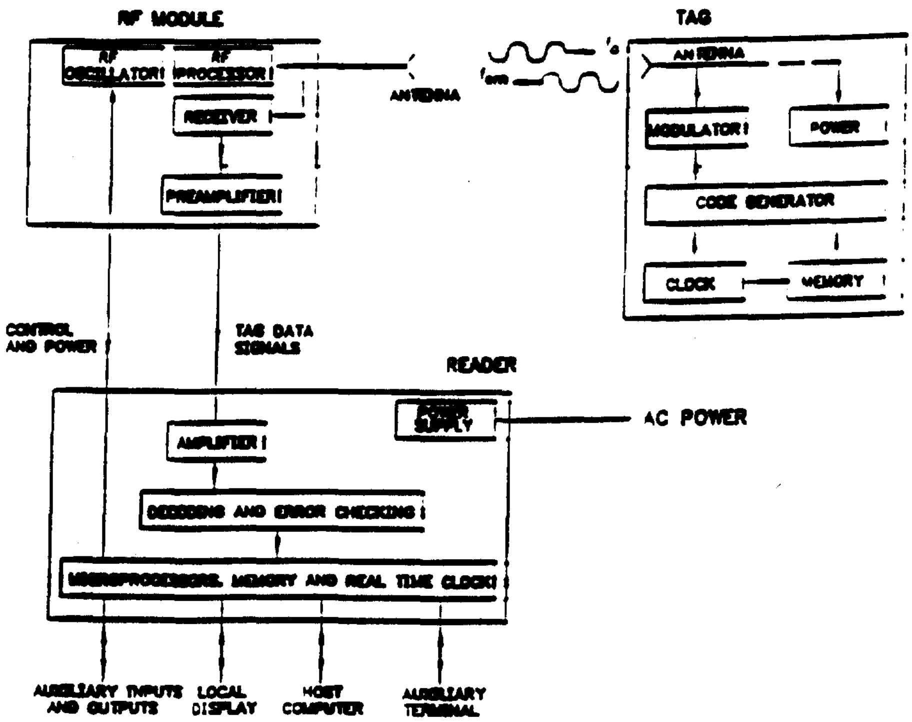


Figure 1. Block Diagram of the RF Module, Reader, Antenna and Tag

1.3 Tag

The Tag shall not be a transmitter and shall not contain components to generate radio frequency (RF) signals. The Tag must act merely as a field disturbance device, slightly modifying and reflecting the signal transmitted by the Reader System. This slight modification of the signal includes the unique identification code of the Tag.

1.3.1 The Tag shall be composed of the Clock, Code Generator, Memory, Antenna circuits, Modulator, Power. The Clock circuit sequences all circuit functions such that information stored in the Memory circuit is conveyed to the Reader System within precise timing. The information stored in the Memory circuit is permanent, and is a unique code which is specified by the owner prior to installation of the Tag onto its respective object (tractor, trailer, dolly, container, etc.).

1.3.2 The Code Generator encodes the information stored in the Memory circuit. The Modulator collects the encoded information from the Code Generator and controls the Antenna circuit such that the encoded information is reflected to the Reader System.

This method of communication is called "modulated backscatter".

1.4 RF Module

1.4.1 The RF Module shall be composed of an RF Oscillator, RF Processor, Receiver, and Preamplifier. The RF Module is responsible for transmitting and receiving radio energy. RF energy is generated by the RF Oscillator and amplified by the RF Processor. This energy is transmitted through the Antenna, and the RF energy reflected by the Tag is also received by the same Antenna.

1.4.2 The RF Module shall transmit a single frequency of RF energy and receive that same frequency after it is reflected from the Tag.

1.4.3 The Receiver shall separate the transmitted continuous wave (CW) energy from the information reflected by the Tag. The Tag information shall be encoded into 20 and 40 kHz signals which modulate the RF energy reflected by the Tag. The RF Module shall have the following approximate specifications:

Description	Typical Specifications
Maximum RF power (measured at transmitter)	2.0 Watts
Standard transmit and receive frequency	912 MHz
Other frequencies available	902 to 928 MHz
Frequency stability	0.0005 percent
Harmonic output	-50 dBc
Spurious output	-60 dBc
Transmitter bandwidth	5 kHz
Receiver bandwidth	130 kHz
Frequency separation for Reader Systems in close proximity	2 MHz

1.5 Reader

The RF Module receives the modulated signal from the Tag and passes the 20 and 40 kHz modulating frequencies to the Reader. The Reader shall decode the frequencies into binary information equivalent to the 128 bits of data stored in the Tag. The Reader is composed of the Amplifier, Decoding and Error Checking circuit, Microprocessor, Real-Time Clock circuit, and Power Supply.

1.6 Antenna

The Reader System shall be capable of using a single Antenna to transmit and receive RF energy.

2. Tag to Sensing Equipment Communication

2.1 The encoding of user data bits shall include 8 sub-bits for each user bit. A sub-bit shall be in coded by the Tag and decoded by the sensing equipment with a modified FSK (frequency shift keying) code using two harmonically related frequencies, one (40 kHz) being the exact double of the other (20 kHz), with a frequency tolerance of ±10%. A "0" bit shall consist of one 20 kHz square wave cycle followed by two 40 kHz square wave cycles. A "1" bit shall consist of two 40 kHz square wave cycles followed by a 20 kHz square wave cycle. All transitions shall be phase-continuous. As depicted in Figure 2, the Tag shall produce a waveform which shall have a nominal 1 microsecond rise and fall time and duty cycle for the 20 and 40 kHz square wave cycles of 50%.

2.2 The Tag electronics shall cause the data to scroll repeatedly without pause from bit "cell" 127 of a frame (a frame consisting of all 128 bits) to bit "cell" 0 of the succeeding frame.

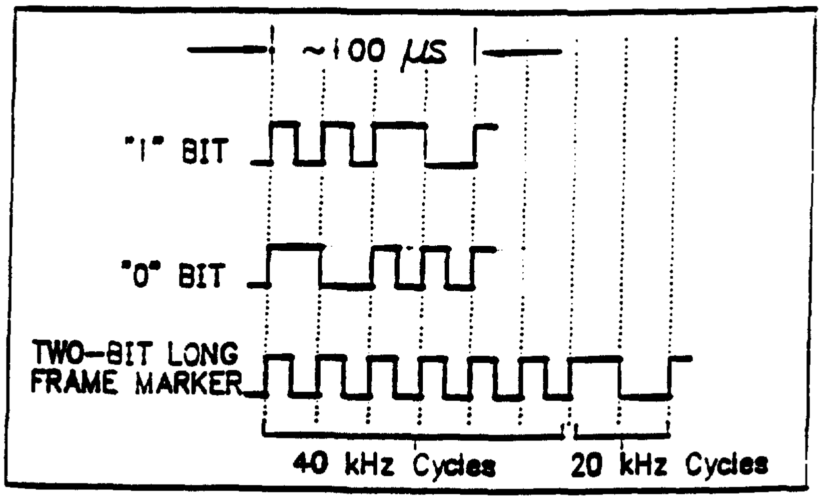


Figure 2: Frequency-shift keying (FSK) encoding.

2.3 The Tag shall use the coded identification data and related permanent information to amplitude-modulate the incoming continuous wave radio frequency carrier signal from the sensing equipment. The resulting modified FSK signal (carrier and sidebands) shall be reflected by the Tag, received by the sensing equipment for decoding, and, after decoding, made available to computerized data processing systems. The modulation polarity shall be of no consequence.

3. Tag Frequency of Operation and Sensitivity

3.1 The Tag shall survive and maintain the integrity of its encoded data in a maximum peak field strength of 50 V/m for 60 seconds, as may be encountered from any radio frequency source such as voice communications equipment.

3.2 A Tag shall be operational within four milliseconds of excitation by an interrogating signal from the sensing equipment.

3.3 When a properly presented Tag is excited as indicated by an incident wave at a given reference range, it shall respond within the following modulated return signal strength, exclusive of carrier and as measured at the same reference range:

				RMS Signal Strength (Microvolts/m)	
Tag Type	Frequency (MHz)	Reference Range	Test Conditions	(Minimum	Maximum
General	902-928	10m	EIRP=1W	1,400	4,100
Container	850-950	10m	EIRP=1W	1,400	4,100
	2400-2500	10m	EIRP=1W	310	900

The Tag's return signal strength shall be reduced by no more than three decibels (dB) when the Tag is rotated by ± 10° in the plane coincident to the antenna polarization (horizontal for tractors, dollies, and chassis, vertical for trailer and container transponders), or rotated by ± 20° in the plane perpendicular to the antenna polarization.

4. Tag Data Content and Format

4.1 The Tag is composed of a minimum of 128 bits of non-volatile memory which can be divided into two sections. The first section is composed of data bits which are allocated for procedural needs and the second section is composed of data bits which are available for general use (General Use area). Procedural needs include error checking, detecting the beginning and the end of the Tag 128 bit data stream, indicating the type of data format utilized in the Tag, and providing security from unauthorized duplication of Tags. Twenty-six bits are used for procedural needs and 102 bits are available for general use.

4.2 Bits reserved for Procedural Needs

A listing of the fields reserved for procedural needs is presented in Table A.

Table A: Allocation of Fields Required for Procedural Needs

Field Designation	Bit Position (out of a possible 0 to 127)
First Check Sum	60, 61
Reserved Frame Marker	62, 63
Security	106-117
Format Code	118-123
Second Check Sum	124, 125
Frame Marker	126, 127

4.2.1 First Check Sum: There are three methods of error detection which are derived exclusively from the Tag data and the way this data is conveyed to the Reader. The Check Sum fields are used in one of the methods to detect errors in the data received by the Reader. The First Check Sum is calculated by adding bits 0 through 59 and truncating all but the right-most two bits of the binary resultant. This calculation is done automatically by the Tag Programmer at the instant the Tag is programmed. When the Reader acquires Tag information, it checks these two bits against its own calculation of Check Sum from the received tag information to determine if there is an error in the previous 60 bits.

4.2.2 Reserved Frame Marker: Reserved for future use as a Frame Marker.

4.2.3 Security: These 12 bits are reserved for Security purposes, although if Security is not desired, these bits can be designated for limited general use. The Security field is divided into two six-bit fields. For Security applications, the two fields may contain any combination of the values presented in Table B or one field must contain a Security value and the other field may contain any value in Tables B or C. If the user requires security, a unique security character will be assigned to the user's Tag Programmer or the security field can be programmed at the factory.

4.2.4 Format Code: The format code indicates the type of coding scheme utilized for the bits defined for general use. The following binary format

Table B: Reserved Security Values

Six-Bit ASCII Character	Decimal Value	Six-Bit ASCII Character	Decimal Value	Six-Bit ASCII Character	Decimal Value
!	1	)	9	?	31
"	2	+	11	@	32
#	3	,	12	[	59
$	4	:	26	\	60
%	5	;	27	]	61
&	6	<	28	^	62
'	7	=	29	_(underline)	63
(	8	>	30		

If the user does not require Security then the two fields can contain any combination of the values shown in Table C.

Table C: Non-Secure Data Values

Six-Bit ASCII Character	Decimal Value	Six-Bit ASCII Character	Decimal Value	Six-Bit ASCII Character	Decimal Value
(space)	0	9	25	N	46
*	10	A	33	0	47
-	13	B	34	P	48
.	14	C	35	Q	49
/	15	D	36	R	50
0	16	E	37	S	51
1	17	F	38	T	52
2	18	G	39	U	53
3	19	H	40	V	54
4	20	I	41	W	55
5	21	J	42	X	56
6	22	K	43	Y	57
7	23	L	44	Z	58
8	24	M	45		

codes have been assigned (most significant bit on the left):

000000: Indicates six-bit ASCII format. This format partitions the General Use area into contiguous six-bit fields into which any character indicated in Tables B or C above can be programmed.

110011: This data format is defined by the International Standards Organization Draft International Standard DIS 10374 and DIS 10374 Addendum 1, the Association of American Railroads Interim Standard (Current Version), and the American Trucking Associations Standard for Automatic Equipment Identification. These standards guarantee that the Data Format, Tag Type, Check Sums, Frame Markers, Equipment Group Code and Security fields will be fixed for all types of referenced equipment and will be uniformly positioned and defined. Other fields, such as the Owner's Code and Length, may expand, contract, or change definition from one type of equipment to the next.

110100: This value indicates a Tag format programmed for toll road use.

There are a total of 61 additional values which have not been assigned and are reserved for future use. Throughout this document, the term "reserved" implies that the value should not be assigned by the User or Owner for his own purposes; the value may be assigned by the ATA, a standards organization or some other regulatory group.

4.2.5 Second Check Sum: Similar function and method of calculation as the First Check Sum except that it is used to help verify the data integrity of Tag bits 62 to 123.

4.2.6 Frame Marker: These two bits contain a special unique signature, which is neither a one nor a zero, and are used to indicate the start of the next frame.

4.2.7 General Use Fields: The allocation and definition of Tag data bits available for general use are specified in the following appendices:

Appendix A - Tractor
Appendix B - Dolly
Appendix C - Trailer
Appendix D - Chassis
Appendix E - Intermodal Container

4.2.7.1 Physical Measurements: All physical measurements (such as length, height, weight, etc.) specified in Appendices A through E shall be integer numbers and shall be encoded into the Tag in metric units. Fractions shall be rounded to the next higher integer.

4.2.7.2 Trailing Blanks: Trailing blanks shall be employed in the Standard Carrier Alpha Code (e.g., Owner's Code) and Identification Number, and leading zeros shall be used on numeric data fields.

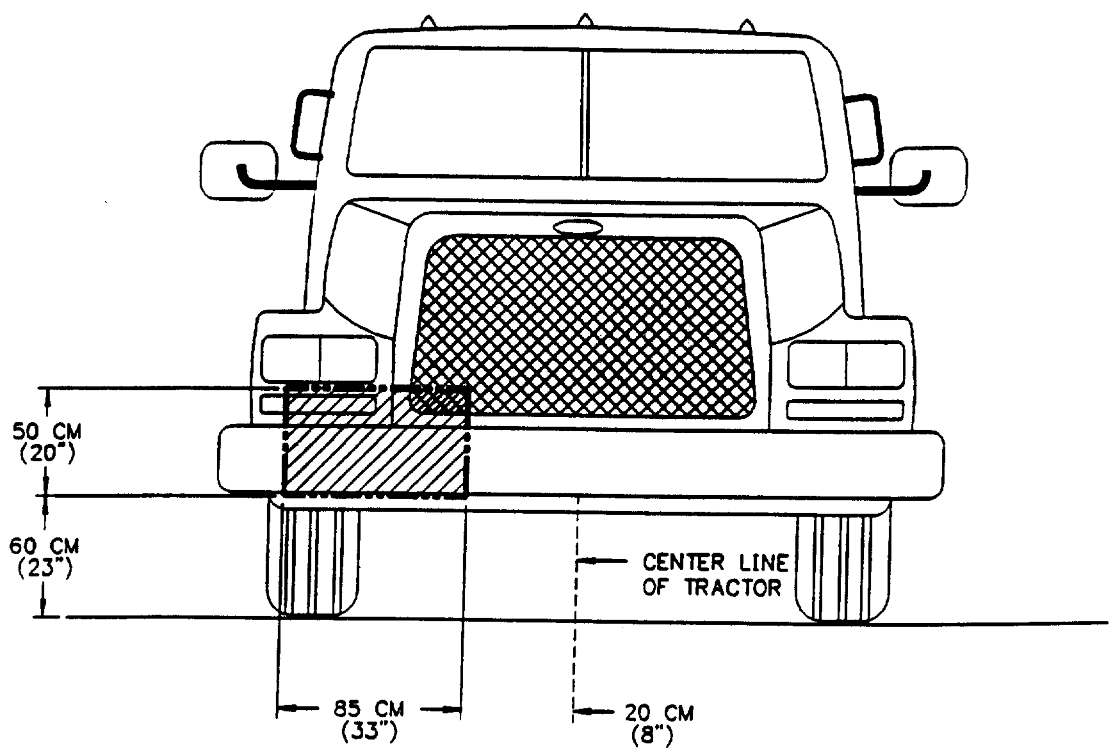
5. Location and Mounting of Tags on Equipment

The Tag shall be capable of permanent mounting and shall have nominal dimensions which do not exceed 30 x 6.0 x 2.0 cm. The Tag shall be attached to a metal surface (or metal plate that is then attached to the equipment). The metal surface should be flat and have a surface area which exceeds the surface dimensions of the Tag by at least 50%.

5.1 Tractor

The Tag shall be mounted on the front surface of the tractor on the right side, in the vicinity of the front bumper. The Tag may be located in a placement window which extends horizontally from 30 cm (1 foot) to 90 cm (3 feet) to the right of the bumper's centerline, and extends vertically from 60 cm (2 feet) to 105 cm (3.5 feet) above the ground, see FIGURE 3.

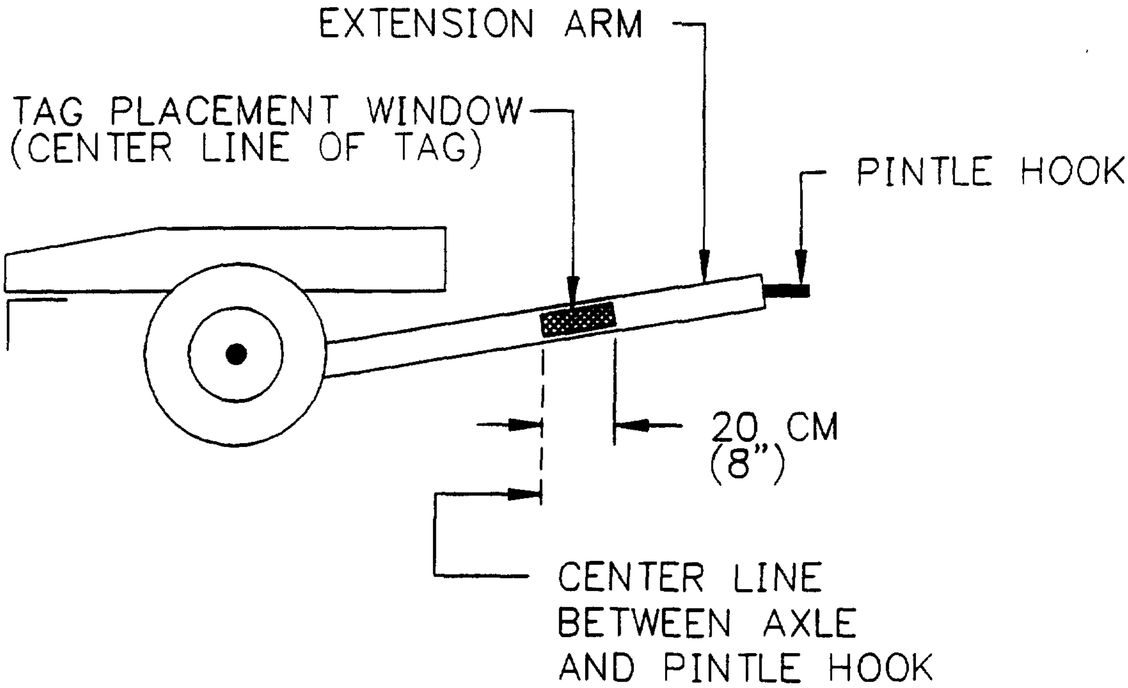
The Tag shall be facing forward and shall be installed horizontally to respond to a horizontally polarized signal from the Reader System.



TRACTOR TAG PLACEMENT
FIGURE 3

5.2 Dolly

The Tag shall be positioned on the right extension arm, facing outward, with the Tag being located midway between the axle and the pintle hook (with a tolerance of -0 cm or +20 cm toward hook) such that it will respond to a horizontally polarized signal from the Reader System, see FIGURE 4.



DOLLY TAG PLACEMENT
FIGURE 4

5.3 Trailer

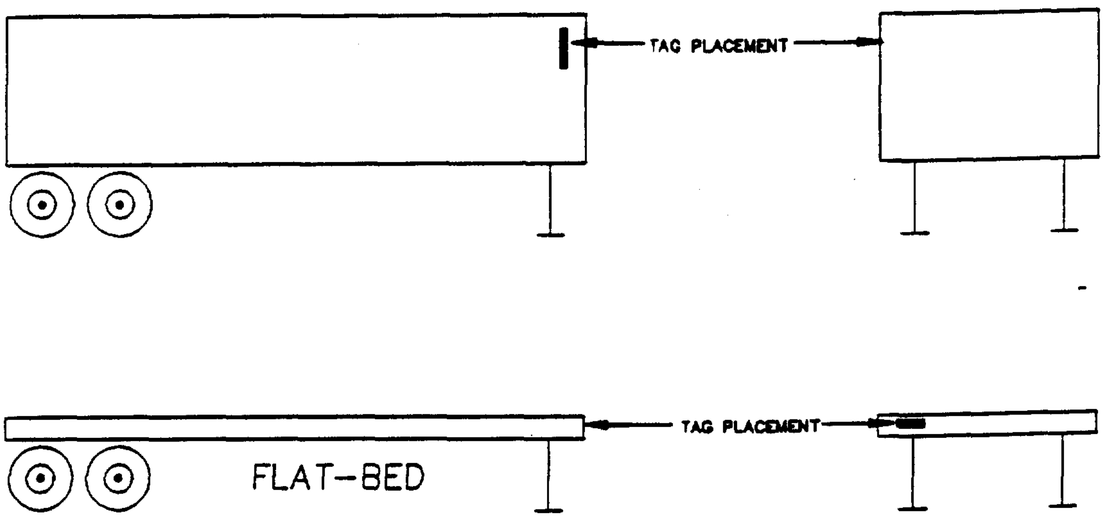
The Tag shall be located on the forward right sidewall of the trailer approximately 30 cm (1 foot) to the rear of the front of the trailer centered 30 cm (1 foot) below the roof line, see FIGURE 5.

The Tag shall be mounted vertically so that it will respond to a vertically polarized signal from the Reader System.

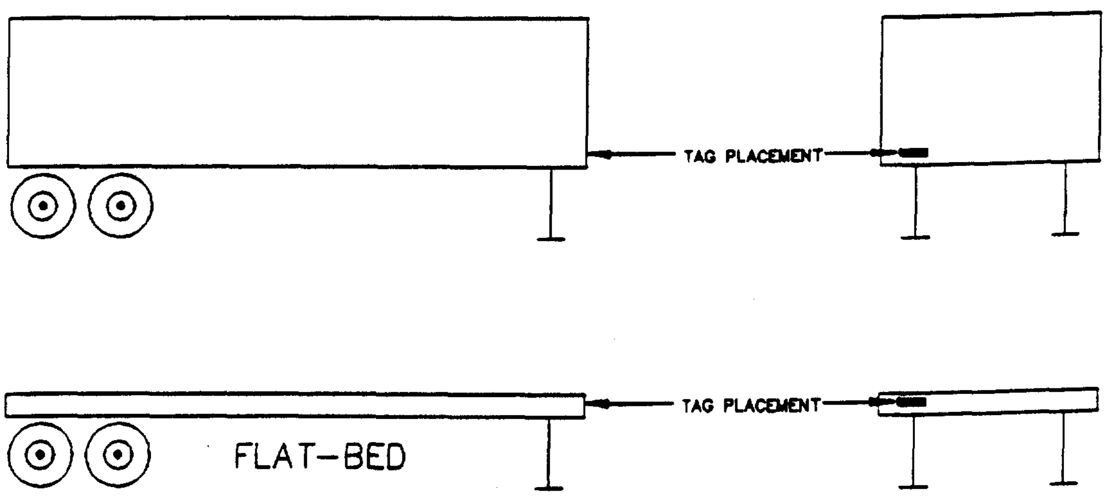
For flatbed trailers and for other situations where the above mounting location is not available, an alternative trailer tagging position is provided.

This Tag shall be located on the front surface of the trailer on the right side. The Tag may be located in a placement window which extends horizontally from the trailer's right side to a point 60 centimeters (2 feet) toward the center of the trailer and extends vertically from the bottom surface of the trailer to a point 30 centimeters (1 foot) above the bottom surface, see FIGURES 5 and 6.

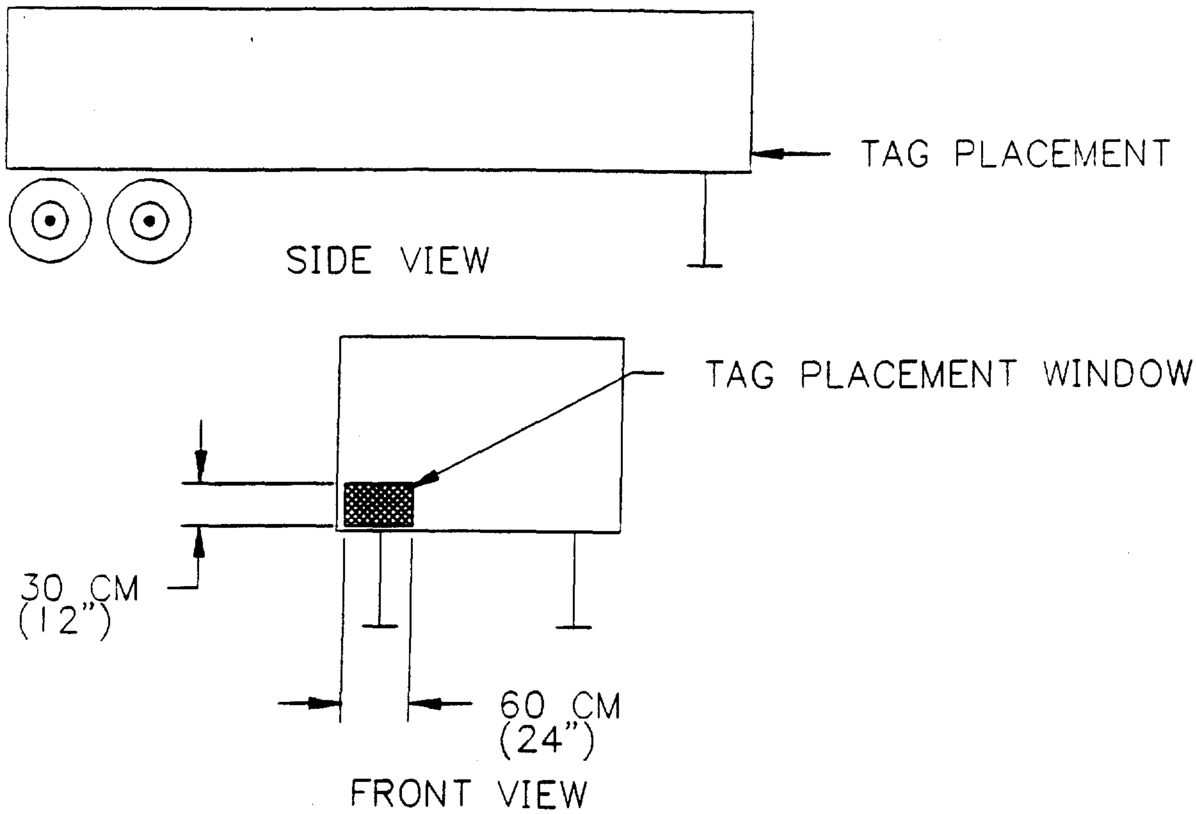
In this second configuration, the Tag shall be facing forward and shall be positioned horizontally to respond to a horizontally polarized signal from the Reader System.



RECOMMENDED TAG PLACEMENT



ALTERNATIVE TAG PLACEMENT
TRAILER TAG PLACEMENT
FIGURE 5



TRAILER TAG PLACEMENT
FOR ALTERNATIVE TAG LOCATION
FIGURE 6

5.4 Chassis

The Tag shall be located on the right hand front corner of the forward bolster. The Tag will be oriented in a forward direction, see FIGURE 7.

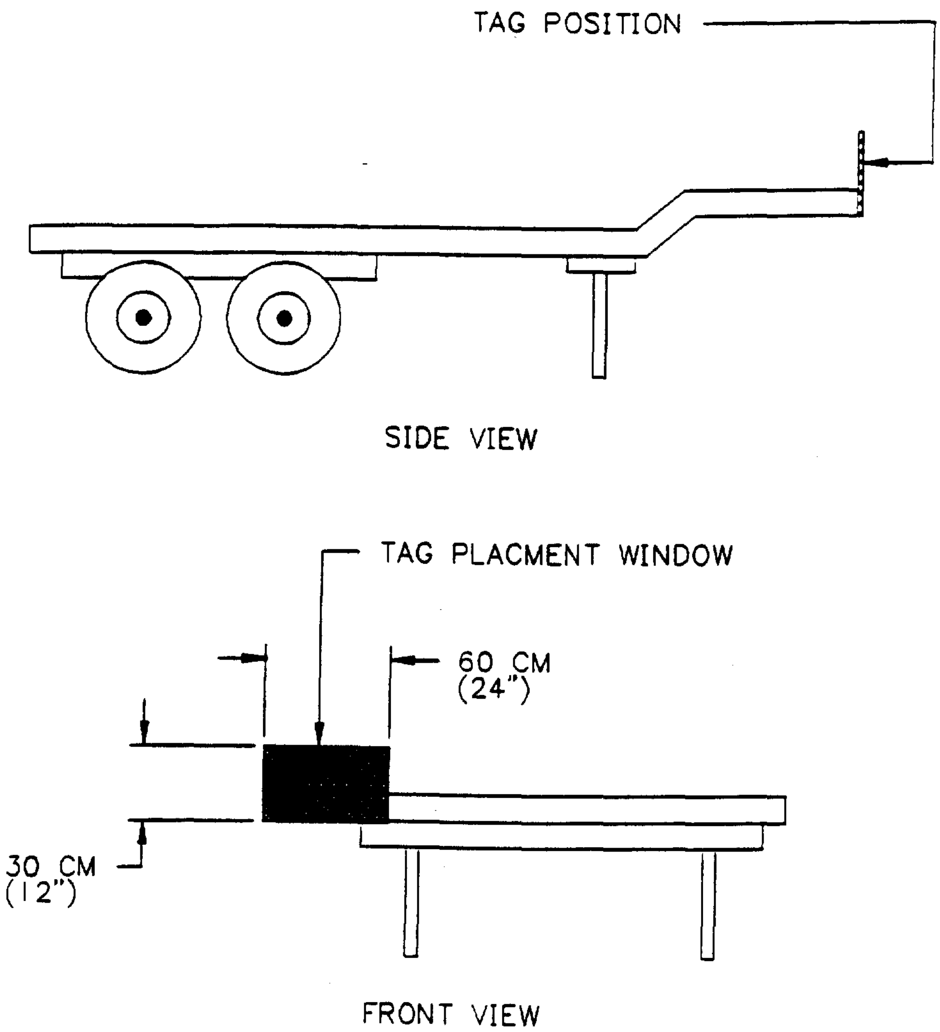
The Tag shall be mounted horizontally so that it will respond to a horizontally polarized signal from the Reader System.

5.5 Container

For containers 40 feet in length or less, the equipment Tag shall be located on the forward right sidewall of the container, approximately one foot to the rear of the front corner post within the first corrugation (if applicable), centered one foot below the roof line of the vehicle, see FIGURE 8. For installation on equipment without sidewalls (e.g., tanks, platform, and rack configurations), the Tag may be located on or adjacent to the right front corner post, facing outward toward the right side of the vehicle.

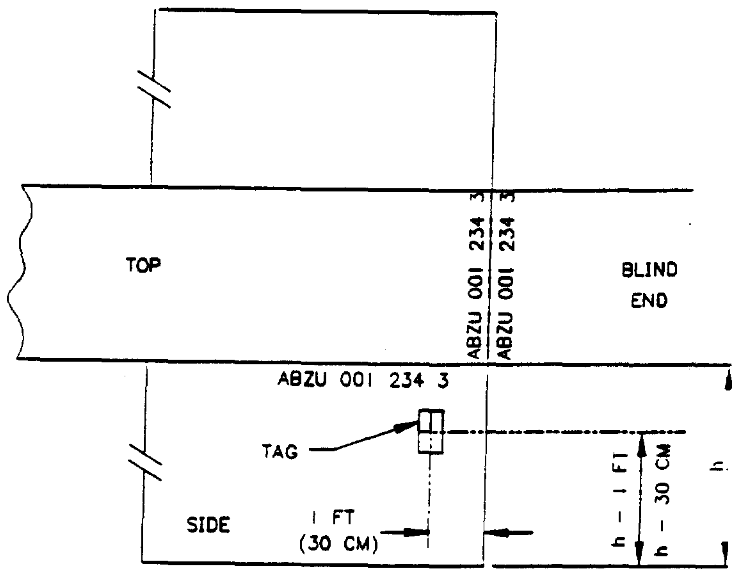
For containers that exceed 40 feet in length, the Tag must be adjacent to the rearward side of the post at the forward 40-foot corner lock position, see FIGURE 9.

The Tag shall be mounted vertically so that it will respond to a vertically polarized signal from the Reader System.



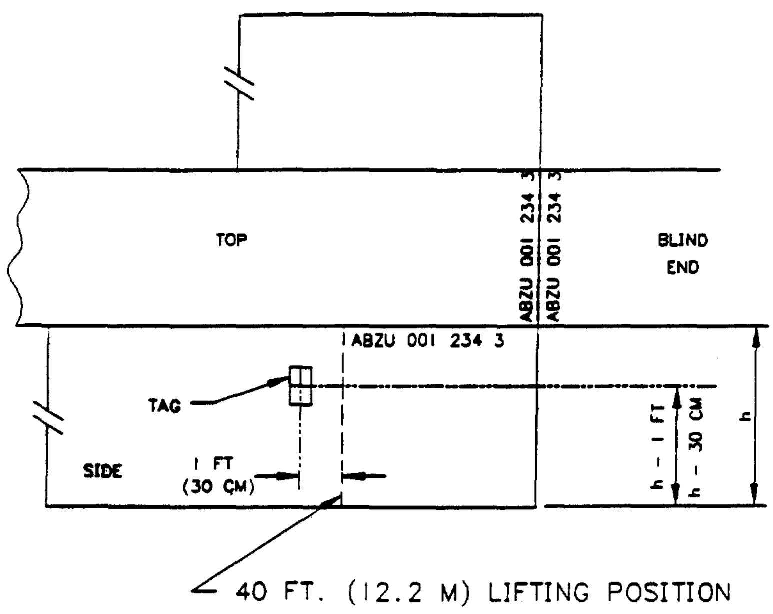
CHASSIS TAG PLACEMENT

FIGURE 7



CONTAINER TAG PLACEMENT
FOR CONTAINERS OF 40 FT. (12.2M) OR LESS

FIGURE 8



CONTAINER TAG PLACEMENT
FOR CONTAINERS GREATER THAN 40 FT. (12.2M) LENGTH

FIGURE 9

May 16, 1990

APPENDIX A

A Description of the Tag Data
Format for the Tractor

1. Bits Available for General Use

Fields specified by the Standard are listed in Table A; General Use fields are indicated in bold type. A description of each General Use field is presented in the paragraphs following Table A.

Table A: Data Field Descriptions for the Tractor Tag

Entry	Bits Required	Tag Data Sequence	Minimum Value	Maximum Value	Units	Units
Equipment Group Code	**5**	**0-4**	**0**	**31**		**Type Code**
Tag Type	**2**	**5-6**	**1**	**4**		**Type Code**
SCAC Code	**19**	**7-25**	**A**	**ZZZZ**		**Alpha**
Identification Number	**42**	**26-59,64-71**	**0**	**ZZZZZZZZ**		**Alphanumeric**
First Check Sum	2	60-61				
Reserved Frame Marker	2	62-63				
Number of Axles	**3**	**72-74**	**0**	**7**		**Axles**
Tare Weight	**8**	**75-82**	**0**	**255**		**100's of Kg.**
Wheelbase	**6**	**83-88**	**26**	**64**		**Decimeters**
Fifth Wheel Off-Set	**4**	**89-92**	**0**	**8**		**Decimeters**
Tare Weight on Steering Axle	**5**	**93-97**	**20**	**50**		**100's of Kg.**
Drive Axle Spread	**5**	**98-102**	**0**	**26**		**Decimeters**
Reserved	**3**	**103-105**				**Reserved**
Security	12	106-117	Reserved for Security or limited Owner's use			
Data Format Code	6	118-123				
Second Check Sum		124-125				
Frame Marker	2	126-127				

The fields are arranged in a hierarchical fashion in order to expedite translation and processing by the data processor. It is intended that the data processor will first look at the Data Format Code to determine if the Tag should be decoded or ignored. For example, in some cases the data processor will wish to ignore all Tags except those specified as highway (ATA Standard) or marine intermodal (ISO Standard) Tags.

Once the Data Format Code has been processed, then the data processor will look to the Tag Type to determine the configuration, capabilities, and memory capacity of the Tag. (Note: This field is provided for future use to accommodate new types of Tags which may have different memory or communication capabilities).

Next, the data processor will examine the Equipment Group Code to determine if the tagged equipment is relevant. For example, the processor may ignore, or process differently, non-revenue equipment than it would trailers or dollies.

The order in which the remaining fields are processed will be dictated by the particular application.

1.1 Equipment Group Code: This is a numeric field having a value from 0 to 31 that indicates the general type of equipment. A proposed table of values for this field is indicated below. Note that only major categories of equipment types are indicated in this field and other fields are allotted to indicate further details. The Equipment Group Code for a tractor is decimal 17 (binary 10001).

Table B: Data Values for the Equipment Group Code

Value	Description	Value	Description
0	Other	16	Reserved
1	Reserved	17	Tractor (Power Only)
2	Reserved	18	Truck (Power and Cargo Bed)
3	Reserved	19	Railcar
4	Reserved	20	Dolly
5	Locomotive	21	Trailer
6	End-of-Train Device	22	Reserved
7	Reserved	23	Reserved
8	Reserved	24	Reserved
9	Reserved	25	Reserved
10	Intermodal Container	26	Reserved
11	Reserved	27	Chassis
12	Reserved	28	Reserved
13	Reserved	29	Reserved
14	Non-Revenue	30	Reserved
15	Reserved	31	Reserved

1.2 Tag Type: The Tag Type indicates the configuration, capability, and memory size of the Tag. At the present time there is only one Tag Type defined, as indicated in Table C:

Table C: Data Values for the Tag Type

Decimal Value	Description
1	Reserved
2	Tag described by the AAR Standard (Current Version), and the ISO Draft International Standard DIS 10374, and the ATA Proposed Standard
3	Reserved
4	Reserved

To code the Tag Type value into the Tag, the decimal value is reduced by one and converted to its base 2 equivalent.

1.3 SCAC Code: The SCAC (Owner's) Code is equivalent to the Standard Carrier Alpha Code (SCAC) and is composed of four letters that can be represented as C1; C2; C3; C4. To code this information in the Tag, the possible letters represented by C1 will be assigned to the following decimal values: A=0, B=1, C=2, ...Z=25. The letters C2, C3 and C4 will be assigned the following values: Blank =0, A=1, B=2, ...Z=26. This code assignment allows for a SCAC Code of less than four characters, with the actual characters left justified, and the remainder of the field padded with blanks.

Conversion from alpha to numeric would involve the following:

1. Determine the numeric equivalent of characters C1 through C4. This will result in four numeric values; N1 through N4.

2. Convert N1 through N4 into one numeric value by using the formula:

$$\text{Value} = (N1 \times 27^3) + (N2 \times 27^2) + (N3 \times 27) + N4$$

The base 2 equivalent of the decimal number "Value" is stored in the Tag's SCAC Code field.

Conversion from a base 2 tag format back to the four SCAC letters would involve the following, where "Value" is the decimal equivalent of the base 2 value in the SCAC Code field.

1. $N1 = \text{Value}/27^3$ (integer - drop fractions)

2. $N2 = (\text{Value} - (N1 \times 27^3))/27^2$ (integer)

3. $N3 = (\text{Value} - ((N1 \times 27^3) + (N2 \times 27^2)))/27$ (integer)

4. $N4 = \text{Value} - ((N1 \times 27^3) + (N2 \times 27^2) + (N3 \times 27))$

5. Use the letter-to-number assignments referred to above to convert N1 through N4 from a numeric value to its letter equivalent.

1.4 Identification Number: The Identification Number consists of eight alphanumeric characters. Each character shall be assigned a numeric value as indicated below: